Serial No. 09/672,512

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Inventor(s): Richard Thomas Aiken
Joe Huang

Case: Aiken 5-11

Serial No.: 09/672,512 **Group Art Unit:** 2681

Filed: September 28, 1998

Examiner: David Q. Nguyen

Title: Shaping of an EM Field For Transmission to Multiple Terminals

THE COMMISSIONER FOR PATENTS
P.O. BOX 1450
ALEXANDRIA, VA 22313-1450

SIR:

Enclosed in triplicate is an Appellant's Brief Under 37 C.F.R. 1.192 Before the Board of Patent Appeals and Interferences in the above-identified appeal.

Please charge the amount of $500.00, covering payment of the fee for the Appeal Brief, to **Lucent Technologies Inc. Deposit Account No. 12-2325**. In the event of any non-payment or improper payment of a required fee, the Commissioner is authorized to charge Deposit Account No. 12-2325 as required to correct the error.

Respectfully submitted,

By James Milton
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I hereby certify that this correspondence (and any paper referred to as being transmitted therewith) is being deposited with the United States Postal Service with sufficient postage as First Class mail in an envelope addressed to: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313 on the date indicated below:

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Date SHARON LOBOSCO

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF
PATENT APPEALS AND INTERFERENCES

Patent Application

Inventors: Richard Thomas Aiken
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Title: Shaping of an EM Field for Transmission to Multiple Terminals

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APPEAL BRIEF UNDER 37 C.F.R. 1.192

This is an appeal to the Board of Patent Appeals and Interferences from the Final Rejection dated November 18, 2004. A Notice of Appeal was timely filed.

1. Real Party in Interest

The real party in interest is Lucent Technologies Inc.

2. Related Appeals and Interferences

Appellants are not aware of any related appeals, interferences, or judicial proceedings.

3. Status of the Claims

Claims 1-7, 9-16, and 18-30 are pending in the application. Claims 1-7, 9-16, and 18-30 stand finally rejected, and the rejection of these claims is being

appealed. Claims 8, 17, and 31 were canceled. A copy of the claims as presently pending is attached hereto as Appendix A.

4. Explanation of the Subject Matter in the Independent Claims

Electromagnetic interference occurs when a first electromagnetic field overlaps with a second electromagnetic field at a point.

In wireless communications, destructive interference occurs when an electromagnetic field directed to a first mobile terminal induces a secondary voltage at the location of a second mobile terminal, where this secondary voltage is out of phase with the primary voltage induced by the electromagnetic field directed to the second mobile terminal. In this case, the secondary voltage will reduce the magnitude of the primary voltage. This reduction in magnitude may be large enough so that the second mobile terminal may not receive an acceptable voltage, and therefore may not receive the signal with an acceptable level of signal quality.

Constructive interference occurs when an electromagnetic field directed to a first mobile station induces a secondary voltage at the location of a second mobile terminal, where this secondary voltage is in phase with the primary voltage induced by the electromagnetic field directed to the second mobile terminal. In doing so, the magnitudes of the two voltages induced at the location of the second mobile terminal will add. In such a case, a smaller amount of energy can be induced at the second mobile terminal by the primary energy directed to the second mobile terminal than if the secondary voltage was not induced.

The present invention relates to a technique for using constructive interference.

Independent claim 1 provides a method of generating a composite electromagnetic field to carry a signal to at least two terminals, in which energy is directed in a plurality of directions. The amount of energy directed towards each of the terminals by the transmitter's antenna is a function of the locations and strengths of the received signals that are acceptable at each of at least two of the

terminals, and the direction of the terminals from the transmitter's antenna is an azimuth direction.

Independent claim 10 provides a transmitter operable to generate a composite electromagnetic field to carry a signal to at least two terminals by directing energy in a plurality of directions. The amount of energy directed towards each of the terminals by the transmitter's antenna is a function of the locations and strengths of the received signals that are acceptable at each of at least two of the terminals, and the direction of the terminals from the transmitter's antenna is an azimuth direction.

Independent claim 18 provides a system comprising a transmitter operable to generate a composite electromagnetic field to carry a signal to at least two terminals by directing energy in a plurality of directions. The amount of energy directed towards each of the terminals by the transmitter's antenna is a function of the locations and strengths of the received signals that are acceptable at each of at least two of the terminals, and the direction of the terminals from the transmitter's antenna is an azimuth direction.

5. Grounds of Rejection Presented for Review

The grounds of rejection presented for review are:

Claims 1-7, 9-16, 18-20, and 22-30 stand rejected under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent Number 5,615,409 issued to Forssen et al. on March 25, 1997 in view of U.S. Patent Number 6,188,913 B1 issued to Fukagawa et al. on February 13, 2001.

Claims 8, 17, and 31 were rejected under 35 U.S.C. §103(a) as being unpatentable over Forssen in view of Fukagawa and further in view of U.S. Patent Number 5,200,755 issued to Matsuda on April 6, 1993.

Claim 21 was rejected under 35 U.S.C. §103(a) as being unpatentable over Forssen in view of Fukagawa and further in view of U. S. Patent Number 6,330,460 issued to Wong on December 11, 2001.

6. Arguments

Rejection Under 35 U.S.C. §103(a) over Forssen and Fukagawa

Claims 1-7, 9-16, 18-20, and 22-30 are rejected under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent Number 5,615,409 issued to Forssen et al. on March 25, 1997 in view of U.S. Patent Number 6,188,913 B1 issued to Fukagawa et al. on February 13, 2001.

Applicants respectfully traverse this ground of rejection.

First, neither Forssen nor Fukagawa teach or suggest applicants' claim 1 limitation that requires that the amount of energy directed in the direction of each of the terminals be a function of 1) the locations and 2) the signal strength that needs to be received to be acceptable for at least two of the terminals.

Instead, Forssen, in effect, teaches that the amount of energy directed towards a mobile station does not depend on the mobile station's location. This can be seen from the fact that channel f1 is broadcast over a wide area, so that a plurality of mobile stations can receive broadcast messages independent of their position, as stated in column 3, lines 53-56.

Applicants note that the Office Action asserts that Forssen teaches applicants' claim 1 requirement that the amount of energy directed in the direction of each of the terminals be a function of 1) the locations and 2) the signal strength that needs to be received to be acceptable for at least two of the terminals, in column 4, lines 36-67. However, that section of Forssen actually teaches that a signal received at an antenna array from a mobile station is used to characterize the position of the mobile station as a function of measured power. This is clearly different from, and perhaps the opposite of, what is claimed in applicants' claim 1, because applicants' claim 1 requires that the amount energy directed towards a terminal be a function of 1) the locations and 2) the signal strength that needs to be received to be acceptable for at least two of the terminals.

The Office Action has cited Fukagawa only for its teaching that the direction of its antenna is in an azimuth direction. Thus, the Office Action seems

to indicate, and applicants agree, that Fukagawa does not supply the element of applicants' claim 1 that was shown hereinabove not to be taught by Forssen. Therefore the combination of Forssen with Fukagawa does not teach or suggest all of the limitations in applicants' claim 1, and therefore claim 1 is allowable over the proposed combination.

Since claims 2-7 and 9 depend from claim 1, these dependent claims are also allowable over the proposed combination.

Similar to claim 1, independent claims 10 and 18 each require that the amount of energy directed in the direction of each of the terminals be a function of 1) the locations and 2) the signal strength that needs to be received to be acceptable for at least two of the terminals, which was shown, as noted, is not taught or suggested by the proposed combination of Forssen and Fukagawa. Therefore, claims 10 and 18 are likewise allowable over the proposed combination. Since claims 11-16 depend from claim 10, and claims 19-30 depend from claim 18, these dependent claims are also allowable.

Rejection Under 35 U.S.C. §103(a) over Forssen, Fukagawa, and Matsuda

Claims 8, 17, and 31 were rejected under 35 U.S.C. §103(a) as being unpatentable over Forssen in view of Fukagawa and further in view of U.S. Patent Number 5,200,755 issued to Matsuda on April 6, 1993.

Applicants note that this ground of rejection was likely carried over accidentally from the prior Office Action as claims 8, 17, and 31 were canceled in the previous amendment.

Rejection Under 35 U.S.C. §103(a) over Forssen, Fukagawa, and Wong

Claim 21 was rejected under 35 U.S.C. §103(a) as being unpatentable over Forssen in view of Fukagawa and further in view of U. S. Patent Number 6,330,460 issued to Wong on December 11, 2001.

This ground of rejection is respectfully traversed for the following reason. Claim 21 depends on claim 18. As noted hereinabove, the proposed combination of Forssen and Fukagawa does not teach or suggest the

requirement of claim 18 that the amount of energy directed in the direction of each of the terminals be a function of 1) the locations and 2) the signal strength that needs to be received to be acceptable for at least two of the terminals. Applicants note that Wong, which is not cited as supplying the missing element, does not teach or suggest the element either. Thus, claim 21 is allowable over the proposed combination under 35 U.S.C. §103(a).

Conclusion

In view of the foregoing, it is submitted that the Examiner is in error. It is, accordingly, respectfully requested that the rejection of claims 1-19 be reversed and the application passed to issue.

Respectfully submitted,
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Lucent Technologies Inc.

Date: 5/4/05

APPENDIX A

IN THE CLAIMS

1. A method for generating a composite EM field to carry a signal to at least two terminals, the method comprising the step of directing energy in a plurality of directions, the amount of energy directed in the direction of each of the terminals being a function of the locations and acceptable receive strengths of at least two of the terminals, wherein the direction is an azimuth direction.

2. The method of claim 1, wherein the function is such that a strength of the EM field at the location of any of the at least two terminals is at least as large as, but not significantly larger than, needed for that terminal to receive the signal carried by the EM field with an acceptable level of signal quality.

3. The method of claim 1, wherein the directing step comprises the steps of:

determining for each one of the terminals an EM field that would have to be generated for the one terminal in order to provide an acceptable receive strength thereat, the determining taking into account the strength, at the location of the one terminal, of EM fields previously determined for others of the terminals;

repeating the first determining step until the EM fields determined for the at least two of the terminals provide an EM field strength for each of the at least two of the terminals that is substantially equal to its adequate receive strength; and

determining the amount of energy to be directed in the direction of each of the terminals based on the EM fields thus determined.

4. The method of claim 3, wherein:

each EM field being represented by one of a plurality of beam-patterns;

the first determining step comprises determining for each one of the terminals a beam pattern that would have to be generated for the one terminal in order to provide an acceptable receive strength thereat, the determining taking

into account the EM field strength, at the location of the one terminal, of beam-patterns previously determined for others of the terminals; and

the repeating step comprises repeating the first determining step until the beam-patterns determined for the at least two of the terminals provide an EM field strength for each of the at least two of the terminals that is substantially equal to its adequate receive strength.

5. The method of claim 4, wherein:

the beam-patterns being voltage beam patterns;

the acceptable receive strength being an acceptable receive voltage; and

the adequate receive strength being an adequate receive voltage.

6. The method of claim 4, wherein one of a plurality of weight vectors corresponds to each of the beam-patterns, and the second determining step comprises the steps of:

determining a composite weight vector using the plurality of weight vectors, and a null-filling factor;

determining a composite beam-pattern using the composite weight vector, the composite beam-pattern representing the composite EM field; and

determining the amount of energy to be directed in the direction of each of the terminals based on the composite EM field.

7. The method of claim 1, wherein the directing step comprises the steps of:

determining for each one of the terminals an EM field that would have to be generated for the one terminal in order to provide an acceptable receive strength thereat if that one terminal was the only terminal that needed to receive the signal;

determining a scaling factor for each EM field such that each EM field, associated with the at least two terminals, scaled by its scaling factor provides an EM field strength at the location of each of these at least two terminals that is substantially equal to its adequate receive strength;

scaling each EM field, associated with the at least two terminals, by its scaling factor; and

determining the amount of energy to be directed in the direction of each of the terminals based on the EM fields thus determined.

8. (Canceled)

9. The method of claim 1, further comprising the step of transmitting the energy.

10. A transmitter operable to generate a composite EM field to carry a signal to at least two terminals by directing energy in a plurality of directions, the amount of energy directed in the direction of each of the terminals being a function of the locations and acceptable receive strengths of at least two of the terminals, wherein the direction is an azimuth direction.

11. The transmitter of claim 10, wherein the function is such that a strength of the EM field at the location of any of the at least two terminals is at least as large as, but not significantly larger than, needed for that terminal to receive the signal carried by the EM field with an acceptable level of signal quality.

12. The transmitter of claim 10, further comprising a processor operable to:

determine for each one of the terminals an EM field that would have to be generated for the one terminal in order to provide an acceptable receive strength thereat, the determining taking into account the strength, at the location of the one terminal, of EM fields previously determined for others of the terminals;

repeat the first determining until the EM fields determined for the at least two of the terminals provide an EM field strength for each of the at least two of the terminals that is substantially equal to its adequate receive strength; and

determine the amount of energy to be directed in the direction of each of the terminals based on the EM fields thus determined.

13. The transmitter of claim 12, wherein:

each EM field being represented by one of a plurality of beam-patterns;

the first determining comprises determining for each one of the terminals a beam pattern that would have to be generated for the one terminal in order to provide an acceptable receive strength thereat, the determining taking into account the EM field strength, at the location of the one terminal, of beam-patterns previously determined for others of the terminals; and

the repeating comprises repeating the first determining until the beam-patterns determined for the at least two of the terminals provide an EM field strength for each of the at least two of the terminals that is substantially equal to its adequate receive strength.

14. The transmitter of claim 13, wherein:

the beam-patterns being voltage beam patterns;

the acceptable receive strength being an acceptable receive voltage; and

the adequate receive strength being an adequate receive voltage.

15. The transmitter of claim 13, wherein one of a plurality of weight vectors corresponds to each of the beam-patterns, and the second determining comprises:

determining a composite weight vector using the plurality of weight vectors, and a null-filling factor;

determining a composite beam-pattern using the composite weight vector, the composite beam-pattern representing the composite EM field; and

determining the amount of energy to be directed in the direction of each of the terminals based on the composite EM field.

16. The transmitter of claim 10, further comprising a processor operable to:

determine for each one of the terminals an EM field that would have to be generated for the one terminal in order to provide an acceptable receive strength

thereat if that one terminal was the only terminal that needed to receive the signal;

determine a scaling factor for each EM field such that each EM field, associated with the at least two terminals, scaled by its scaling factor provides an EM field strength at the location of each of these at least two terminals that is substantially equal to its adequate receive strength;

scale each EM field, associated with the at least two terminals, by its scaling factor; and

determine the amount of energy to be directed in the direction of each of the terminals based on the EM fields thus determined.

17. (Canceled)

18. A system comprising a transmitter operable to generate a composite EM field to carry a signal to at least two terminals by directing energy in a plurality of directions, the amount of energy directed in the direction of each of the terminals being a function of the locations and acceptable receive strengths of at least two of the terminals, wherein the direction is an azimuth direction.

19. The system of claim 18, wherein the function is such that a strength of the EM field at the location of any of the at least two terminals is at least as large as, but not significantly larger than, needed for that terminal to receive the signal carried by the EM field with an acceptable level of signal quality.

20. The system of claim 18, further comprising a processor coupled to the transmitter, the processor operable to:

determine for each one of the terminals an EM field that would have to be generated for the one terminal in order to provide an acceptable receive strength thereat, the determining taking into account the strength, at the location of the one terminal, of EM fields previously determined for others of the terminals;

repeat the first determining until the EM fields determined for the at least two of the terminals provide an EM field strength for each of the at least two of the terminals that is substantially equal to its adequate receive strength; and

determine the amount of energy to be directed in the direction of each of the terminals based on the EM fields thus determined.

21. The system of claim 20, wherein the processor being located in the transmitter.

22. The system of claim 20, wherein the system is a wireless communication system having at least one MSC, and the processor being located in the MSC.

23. The system of claim 20, wherein:

each EM field being represented by one of a plurality of beam-patterns;

the first determining comprises determining for each one of the terminals a beam pattern that would have to be generated for the one terminal in order to provide an acceptable receive strength thereat, the determining taking into account the EM field strength, at the location of the one terminal, of beam-patterns previously determined for others of the terminals; and

the repeating comprises repeating the first determining until the beam-patterns determined for the at least two of the terminals provide an EM field strength for each of the at least two of the terminals that is substantially equal to its adequate receive strength.

24. The system of claim 23, wherein:

the beam-patterns being voltage beam patterns;

the acceptable receive strength being an acceptable receive voltage; and

the adequate receive strength being an adequate receive voltage.

25. The system of claim 23, wherein one of a plurality of weight vectors corresponds to each of the beam-patterns, and the second determining comprises:

determining a composite weight vector using the plurality of weight vectors, and a null-filling factor;

determining a composite beam-pattern using the composite weight vector, the composite beam-pattern representing the composite EM field; and

determining the amount of energy to be directed in the direction of each of the terminals based on the composite EM field.

26. The system of claim 18, further comprising a processor coupled to the transmitter, the processor operable to:

determine for each one of the terminals an EM field that would have to be generated for the one terminal in order to provide an acceptable receive strength thereat if that one terminal was the only terminal that needed to receive the signal;

determine a scaling factor for each EM field such that each EM field, associated with the at least two terminals, scaled by its scaling factor provides an EM field strength at the location of each of these at least two terminals that is substantially equal to its adequate receive strength;

scale each EM field, associated with the at least two terminals, by its scaling factor; and

determine the amount of energy to be directed in the direction of each of the terminals based on the EM fields thus determined.

27. The system of claim 18, further comprising an antenna operable to transmit the energy.

28. The system of claim 27, wherein the antenna is a phased-array antenna.

29. The system of claim 18, the system being a base station and the terminals being mobile terminals.

30. The system of claim 18, the system being a wireless communication system and the terminals being mobile terminals.

31. (Canceled)